

## CANDLE SCENT DELIVERY PELLET

This invention relates to a concentrated scented pellet for introducing scent to a candle.

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Commercially available candles are generally made of either a synthetic wax such as paraffin wax, or an organic wax such as a plant or animal wax eg beeswax. Lower cost mass produced candles tend to be made from paraffin wax.

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Scented candles are commonly available for delivering a pleasant scent to a room while they burn, and in particular wax candles, rather than liquid gel candles, employing a wick are supplied with a scent integrated into the candle wax in a concentration, typically 3% to 5%, suitable for  
15 delivering a scent which is neither too weak nor overly strong, and in particular in a concentration that is acceptable for room based use by the consumer and in a concentration that is not dangerously high which could lead to a lower flash point for the candle, particularly relevant for tea lights which achieve a high normal operating temperature. Also, high  
20 scent concentrations tend to mechanically weaken the wax leading to a poor quality candle.

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Currently scented candles are supplied with a scent locked into the wax of the candle, and this scent is typically in the form of a fragrance oil or  
25 perfume mixed into the bulk wax of the candle. As the candle burns a melt pool is formed around the wick. The scent in this melt pool evaporates or is burned to give the candle a scent, and typically the scent concentration in this melt pool is less than that in the solid part of the candle as necessarily some of the scent has been consumed. Higher  
30 concentrations of scent in this melt pool give the candle a stronger scent. It is the melt pool which is largely responsible for the scent of the candle

so the melt pool is the active scent production part of the candle and the solid part of the scented candle is simply a store of material waiting its turn to be melted and burned.

5 It may be thought that a scented fluid, such as a fragrance oil or perfume, could be poured directly into this melt pool. While this is true, the scent will tend to float on top or sink to the bottom of the melt pool as it is of a different density to the melt pool wax, and mixing will be poor. Also, this is not a very convenient or safe way to add the scent to the melt pool, and  
10 risks the concentrated scent material coming in direct contact with the candle flame which could then ignite and be a fire risk and could also promote production of toxic combustion products from the raw scented material. In addition, the scent production of the candle after adding the scent will tend to be non-uniform.

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One problem with scented candles is that the scent is locked into the bulk wax of the candle and so the scent that the candle produces while burning is unchangeable for the life of the candle's normal use. In order to change the scent the user must light a candle of a different scent, so to change  
20 scent requires an entirely separate candle.

Another problem with pre-scented candles is that the mechanical properties of the candle tend to be compromised by the scented material introduced to produce the scent, and in particular this scented material  
25 tends to reduce the mechanical strength of the candle and is a limiting factor in the amount of scent that can be added to the candle before the candle becomes too weak for use.

A further problem with pre-scented candles is that high concentrations of  
30 scent, which are advantageous in terms of scent production quantity while burning, produce a fire hazard as the higher the scented material

concentration, for instance of fragrance oils and perfumes, the lower the flash point of the candle wax. In very high scent concentrations the candle risks flash ignition of the melt pool.

- 5 Accordingly the present invention provides a scented pellet for introducing scent to a candle comprising a bulk material and scent, wherein the pellet is arranged to release the scent upon melting of the bulk material in the candle's melt pool surrounding the wick.
- 10 The bulk material of the pellet may comprise one of or a mixture of synthetic wax and organic wax. For example, the wax may be beeswax, paraffin wax, or any other suitable plant or biological wax.

- The concentration of the scented material is preferably higher than that of
- 15 typical scented candles. The concentration of the scented material is preferably at least 3%, more preferably at least 5% and still more preferably approximately 10%. In some circumstances higher concentrations may be possible, for example up to 15% or above, or up to 20% or above. It may also be possible to use concentrations as high as
- 20 50% or more, or even pure scent. This percentage may be the percentage volume of scent in the bulk material or alternatively may be the percentage volume in the whole pellet.

- The scented material may comprise a perfume or alternatively may
- 25 comprise fragrant oil. Any suitable synthetic scent or scent of biological origin may be used, for example, aromatic oils. Though these scents may normally be in pure form liquid at room temperature, scented material in solid form may also be added to the pellet, for instance as a powder, and this scent may melt at temperatures found typically in the molten wax in
- 30 the candle melt pool.

The mixture of bulk material and scented material may preferably be a solid. Alternatively, the mixture may be a non-solid amorphous material such as a paste or may comprise gaseous pockets to form a solid foam. A  
5 foamed pellet has the advantage of rapid melting and therefore results in more rapid production of scent by the candle. The maximum concentration of scent in pellets in which the mixture of bulk material and scented material is a solid is determined by the concentration at which the mixture at room temperature becomes non-solid.

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Alternatively, the pellet may comprise a liquid scent core within a solid bulk material capsule or shell.

The pellet may further comprise a coating. The coating may be made  
15 from any suitable hard combustible material such as wax. For example, paraffin wax or beeswax may be used. Either one of, or both of the bulk material of the pellet and the coating may contain a colourant such as a coloured dye or pigment. For example, different colours may be used for different fragrances. In this way a set of pellets may be provided the  
20 pellets having different colourants, and different scents, each pellet of a particular colourant having a corresponding scent. This enables the scent of the pellet to be determined by its colour. The colourant may be contained only in the coating, or the coating may contain more colourant than the main body of the pellet. In some circumstances, the colourant  
25 may be a dye that oxidises upon melting of the pellet so as to minimise the amount of colour added to the melt pool of the wax.

The coating may contain less scent than the main body of the pellet, preferably substantially no scent. The coating may also be less permeable  
30 than the main body of the pellet, thereby being arranged to prevent scent from the main body of the pellet from escaping, until the pellet melts.

The coating may be more rigid, or more solid, than the main body of the pellet. This may enable it to provide support for the main body of the pellet. This may be particularly desirable if the main body of the pellet is in the form of a paste. The coating may also have a higher melting point than the main body of the pellet so that it can provide support for the pellet at warmer temperatures. Alternatively it may have a lower melting point, so that it will melt quickly in use thereby allowing the scent in the main body of the pellet to escape more quickly in use.

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Preferably, the diameter of the pellet may be between 2mm and 30mm and may be between 3mm and 20mm, or between 8mm and 20mm. The size of the pellet is suited to the size of the candle into which the pellets are to be added. For example, pellets with a diameter of approximately 2mm or 3mm may be chosen for small candles, whereas larger pellets may be suitable for use with larger candles. The size of the pellet is selected to ensure that the increased volume of the melt pool when the pellet or pellets have been added to it is not large enough to swamp the wick. The pellets may be provided in a variety of shapes. For example, the pellet may be any one of a sphere, cylinder, cube, tear-drop, disc, horse-shoe, cigar-shape or any other suitable shape. Alternatively, the pellet may have a bore through it through which the wick of a candle can pass or may be shaped in such a way as to indicate the scent of the pellet.

25 Preferably, the melting temperature of the bulk material of the pellet is substantially the same as that of the candle and is preferably in the range of 40°C to 90°C, or more preferably in the range of 55°C to 90°C.

30 The outer surface of the pellet may be treated, either chemically or heat treated, to reduce the porosity of the pellet or to improve the mechanical strength of the pellet. The bulk material may also further comprise an

additive to increase the uptake of scent or to increase the hardness of the bulk material. For example, an additive may be a fixative to improve retention of the scent in the bulk material.

5 According to a second aspect of the invention, there is provided a method of introducing scent to a candle, the method comprising the step of adding one or more scented pellets to the melt pool of a lit candle, wherein the melt pool of a candle is an area surrounding the wick at the top of a candle.

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The method of introducing the scent may further comprise the step of allowing the one or more pellets to melt in the melt pool of the candle, facilitating release of the scent by the motion of convection currents established in the melt pool of the candle.

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This provides a convenient method for adding scent to the melt pool while also adding additional fuel to the candle to assist in its longevity, and as the scented material is locked into the bulk material of the pellet, then the scent is slowly delivered to the melt pool avoiding the fire risks  
20 mentioned above while also providing a more uniform release of the scented material into the melt pool thereby promoting uniform mixing of the scent with the wax in the melt pool leading to more uniform scent production by the candle. Dosing the melt pool with scented material enables a higher concentration of scent to be used than is normally  
25 acceptable or possible in a commercially available candle.

By adding the scent directly to the melt pool of a virgin wax candle, then the strength of the candle is not compromised at all leading to simpler manufacture and shipping, and a better quality product in terms of  
30 appearance and strength.

Preferred embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

- 5 **Figure 1** is a cross-section of a candle illustrating convection currents established in the melt pool;

**Figure 2** is a cross-section of a spherical scented pellet without coating;

- 10 **Figure 3** is a cross-section of a spherical scented pellet further comprising a coating;

**Figure 4** shows a cross-section of a cigar shaped coated scented pellet; and

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**Figure 5** is a plan view of a horseshoe shaped pellet in the melt pool of a candle.

- The purpose of the invention is to temporarily and changeably introduce  
20 scent to an otherwise unscented candle by addition of this scent into the wax melt pool found at the burning end of the candle once the candle flame has established a temperature within the wax around the flame high enough to form this melt pool. Introduction of scent into the candle melt pool by adding a highly concentrated scent pellet has the effect of diluting  
25 this scent into the wax melt pool thereby giving the candle a scent while the scented material is being used up, typically by evaporation. The scent in the pellet is diluted into the melt pool from its higher scent concentration in the pellet to a lower concentration suitable for normal operation of a scented candle. Since the scent is only added to the melt  
30 pool which has no structural role in the candle then the mechanical

strength of the solid part of the candle is unaffected by the introduction of the scented material.

5 The problem of the fire hazard caused by high concentrations of scent in a candle is avoided with virgin wax candles using the scented pellet invention since as only the melt pool is dosed with scent, then the flash point of the bulk candle itself is not compromised. In an extreme situation where the candle melt pool is highly dosed with scented pellets then the wick tends to be swamped by the additional wax of the scent pellets so  
10 either reducing the flame or extinguishing the candle, and this is an inherently safe negative feedback system. Should the melt pool actually ignite at its flash point, then this flame will quickly extinguish as the oil/scent combustible material within the melt pool is used up since the candle itself has no further oil/scent to add to the pool to sustain the  
15 flame.

Another advantage of this invention is that the virgin wax candle to which the scent pellets are added are much cheaper and more readily available than pre-scented candles. In practice, adding a scent pellet to a virgin wax  
20 candle is inherently cheaper and more controllable for the consumer than buying pre-scented candles. The method also allows the consumer to change the scent of the candle when desired, although either the current scent must have dissipated from the melt pool or the melt pool of the candle must have been discarded and a new virgin melt formed by waiting  
25 for the wax to form a new melt pool before adding the pellet.

Though not necessarily an advantage, a distinguishing property of this invention is that as only the melt pool of the candle is directly dosed with the pellet and the materials contained within it then the colour of the  
30 candle is not affected other than in and around the melt pool. In practice this allows the end user of the candle to choose a candle colour according



to appearance rather than scent and this choice is limited only by the availability of colours, shapes and sizes supplied by manufacturers. In the case of pre-scented candles, the colour of the candle is often affected by the scent material, and in any case a pure white candle is difficult to achieve with scented additives but easy to achieve with virgin wax, and this colour is not affected by the addition of a scent pellet other than in melt pool and immediate environs.

Typically the bulk material of the scented pellet in the present invention is a wax and preferably suitably chosen for holding high concentrations of scented material, and to this wax may also be added ingredients for improving uptake of scents into this material, for instance Vybar for waxes such as paraffin wax which promotes uptake of the scent. Commercially available materials that can be employed for the pellet include paraffin wax, beeswax, and plant and other biological waxes. Other additives also exist for improving hardness of wax, and these may also be added to the wax of the present invention to assist in stabilising the solid structure of the pellet in cases of high scent concentration.

Typically the scent contained within the pellet will be either a perfume or a concentrated fragrant oil, and may be either of biological origin or be a synthetic scent contained within a suitable substrate. Examples for this are perfumes and aromatic oils. An object of this invention is to dose the scented pellet's bulk material, for instance wax, with a high concentration of scented additive. Accordingly, the scent concentration is limited only by the ability of the bulk material of the pellet to stably hold this scent while at the same time maintaining mechanical strength and solidity, and this concentration depends on choice of bulk material, beneficial strength improving and scent locking additives, and type of scented additive.

In one embodiment of this invention to be described later here, the upper none-inclusive limit of scented additive concentration is the point at which the bulk material loses solidity, for instance becoming a paste.

5 In another embodiment of this invention to be described later here, the upper limit for scent concentration is exceeded so that the bulk material becomes a non-solid amorphous material such as a paste, and this paste is encapsulated by a solid coating, and for instance wax, and this wax may optionally be chemically or heat treated to improve the mechanical  
10 strength of the pellet or to reduce the coating's porosity for the purpose of retaining the scented material within the scented inner paste. Encapsulating a solid scented pellet may also be beneficial for adding a colour to an otherwise uncoloured pellet, or for improving long term scent retention.

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In another embodiment of the invention, the scent concentration is so high that the bulk material becomes a liquid. Alternatively, pure liquid scent may be used. The liquid is encased in a solid bulk material such as wax. The liquid scent may be introduced into the pellet in a number of ways.  
20 For example, liquid scent may be injected into a hollow pellet and the injection hole sealed to prevent leakage of the scent. As with other embodiments, colourant may be added to the pellet and the pellet may be chemically or heat-treated to improve the mechanical strength of the pellet or to reduce the porosity of the pellet.

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A colourant may also be incorporated into the pellet for the purpose of colour coding the pellet, or the uncoloured pellet may be coated with a layer of coloured wax for the same purpose, and materials suitable for adding this colour include dyes and pigments. The word *colourant* has  
30 been adopted from the American version of English and is intended to mean "something that adds colour". A colourant such as a dye may be

selected so as to oxidise on melting. This reduces the colourant remaining in the melted wax since it may not be desirable to have a strongly coloured wax in the melt pool of the candle, particularly if the colour of the pellet differs to that of the candle.

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The shape of the pellet is not of particular relevance to the pellet's function as the pellet is melted once introduced into the candle melt. However for ergonomic use and manufacturing ease preferable shapes include spherical, cylindrical, tear-drop, cigar shaped, disc shaped, and  
10 oblate shapes. In more general terms, the pellet may be thought of as having the shape of any generic "lump".

The size of the pellet is adapted to the size range of the melt pools typically produced in commercially available candles. The size of the  
15 pellet in the present invention ranges from sufficiently small enough so that introduction of the pellet into the candle melt pool firstly does not overly increase the volume of the candle's melt pool to the point where the wick becomes swamped, to sufficiently large for ergonomic handling by a human hand and for delivering a sufficient quantity of scent in to the  
20 candle's melt pool to raise the melt pool's scent concentration to a level sufficient so that the scent production of the candle is acceptably strong for the consumer. As more than one pellet may be introduced by the consumer to the melt pool of a candle, then the scent pellet size is more relevant to ergonomic human handling and to the avoidance of swamping  
25 the wick in smaller candles since larger candles may have several pellets added to dope the melt to a suitable concentration before risking swamping the wick.

One of the advantages of this invention is that a single virgin wax candle  
30 may be used to deliver a range of scents, the limitation in this range being the range of available scents provided by the scented pellet in the present

invention. Since the scent pellets are of relatively small size, for instance “pea” sized, then a great variety of pellets with different scents may be supplied in a single container, for instance, and if colour coded then the consumer may select a scent from the range supplied and add one or more  
5 of these pellets, either of the same scent or a mixture of scents, to the candle’s melt pool.

By adding more than one pellet to the candle’s melt pool then the concentration of scent in the melt pool may be increased by the consumer  
10 to increase the scent production of the candle, and the limit to the number of pellets added is the point at which the total volume of added pellet material leads to swamping of the candle wick and subsequent extinguishing of the candle’s flames.

15 An advantage of this invention is that only the candle melt is doped with the scent so that though the user may add a potentially dangerous amount of scent to the melt pool, for instance by adding multiple pellets at one time, and this may reduce the flash point of the melt pool considerably, then should the candle melt pool ignite then this fire will quickly dissipate  
20 as the fragrant material burns out of the melt pool since the fragrant material will not be replaced as would happen in a fully scented candle in which the scent is locked into the candle itself.

A further advantage of this invention is that as the scent is delivered  
25 directly to the candle melt, then the bulk material of the candle can be mixed for appearance and strength rather than compromising these for the purpose of also holding scent.

Though candles come in many shapes, the operation of a typical candle  
30 remains the same in that a combustible wick is provided which when ignited melts the wax and promotes uptake of the wax by the wick which

ignites the wax to produce a flame. The flame melts the wax surrounding the wick into a pool, the *melt pool*, and as the wax in this melt pool is burned it is replaced by wax from the solid part of the candle around the melt. The candle dissipates heat from the melt pool and a dynamic  
5 equilibrium is established in which the melt pool remains roughly the same volume and size while the candle burns down and is consumed.

Of particular interest to the present invention are the dynamics of the melt pool, especially the convection currents set up within it. Figure 1 shows a  
10 cross-section illustration of a typical melt pool with an example convection current shown as a series of idealised loops 2 which circulate the wax around the melt pool. The flame 1 around the wick 6 provides radiant heat that heats the wax in the melt pool 3. The wax in the melt pool that is closer to the flame is exposed to higher levels of heat  
15 radiation and becomes hotter than wax lower down and further away from the flame and thereby becomes hotter and of a lower density than material lower down in the melt pool and further away from the flame. This sets up a temperature and density gradient in the wax which causes the wax to rise in the centre of the melt pool and then stream off to the outside of the  
20 pool before cooling and circulating back to the middle/bottom of the pool where it again rises resulting in the convection currents 2 shown as closed loops here for simplicity. In practice the convection currents are turbulent but the principle stands that the circulating currents promote melting of the scent pellet and mixing of the scent within the melt pool. Once mixed  
25 with the wax of the melt pool, the scent delivered by the pellet is slowly released to the air around the operating candle. Figure 1 shows a melt situation in which the melt pool is a portion of the candle so that an interface 4 exists between the melted wax pool and the solid wax of the remainder of the candle. Other situations arise, for instance with a tea-  
30 light candle, in which the entire candle is often melted and the shape of

the candle is maintained by a container typically provided by a glass or a metal shell.

5 The scented pellet of the present invention here is introduced into the candle melt pool 3. The convection within the pool assists to quickly melt the pellet and mix the scented material contained within the pellet with the wax of the pool. Once mixed, this scent produces an odour which is delivered to the air in the area or room around the candle in the manner of an ordinary scented candle.

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Typically the concentration of scent within the bulk material of the pellet is higher than that found in the wax of a typical scented candle so that the pellet, once melted and mixed in the melt pool, will produce a diluted scent concentration appropriate for producing a sufficient quantity of scent from the candle. So, for instance if the final melt pool has a volume  $V$ , the melted pellet has a volume  $V/4$ , and the melt pool has a volume of  $V \times 3/4$ , then if the pellet is to produce the fragrance concentration  $C$  of an example scented candle's melt pool then the pellet will require to have a fragrance concentration of  $4 \times C$  in order to produce a melt pool fragrance concentration equal to that of the standard scented candle, at least instantaneously before the scent begins to dissipate.

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In practice, the fragrance concentration of the melt pool of a standard scented candle is less than that of the solid wax of the same scented candle as the scent dissipates from the melt pool and is only slowly replaced by fragrance released in the melting of the main bulk of the candle around the melt pool. By way of example, if an actual concentration ratio of the fragrance in the melt pool to the fragrance in the bulk of a scented candle is 0.25, then the concentration of fragrance in the scent pellet would be  $C$  to achieve the same final melt pool fragrance concentration, ie the same as the scent concentration in the wax

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of the candle. In this example, the scented pellet may then be made smaller and have an accordingly higher concentration in direct ratio to achieve the same effective fragrance concentration in the melt pool. Clearly, the higher the scent concentration in the scent pellet the smaller  
5 the required volume of the pellet for the same effective fragrance concentration in the melt pool to which it is added. Accordingly, though not limited thereto, an object of this invention is to maximise the fragrance concentration in the scented pellet to reduce the required volume of the scented pellet for the same concentration of scented  
10 material in the melt pool while maintaining the solid structure of the pellet.

Clearly an upper limit exists for the concentration of scented material within the pellet 1 and this limit is dictated by the ability of the bulk  
15 material of the pellet to stably hold this scented material while also maintaining the solidity of the pellet during manufacture, transport, storage, and final use of the pellet.

As the pellet in this invention is relatively small compared to the size of a  
20 candle, and in particular the pellet is smaller in volume than the volume of the melt pool of the typical candle to which the pellet could be added, then the mechanical strength of the pellet may be smaller than that required for a complete candle as the stresses applied to the pellet during handling are smaller compared to those stresses in a candle. In practice,  
25 the strength of the pellet is secondary to the requirement for maximising the stable scent content of the pellet, and the pellet can be quite weak compared to the strength of a typical scented candle. Accordingly, the percentage scented material added to the scent pellet may be higher than that of a scented candle, and may be increased to the limit of the ability  
30 of the bulk material to maintain its solidity.

Another supplementary goal of this invention is to quickly distribute the scented additives of the pellet into the melt pool of the candle. To facilitate rapid melting of the pellet the bulk material of the pellet may be foamed to include gaseous pockets. A foamed pellet has the characteristic  
5 that the total weight of material within the volume of the pellet is less than that of a solid pellet of the same size, and the total surface area of the foamed pellet in active contact with the melted wax of the melt pool is greater since the foamed material has a microstructure that is convoluted and hence of a larger surface area than a simple smooth surfaced solid  
10 pellet. Rapid melting of a foamed pellet facilitates more rapid introduction of the scented additives into the melt pool and therefore a more rapid production of scent by the candle.

An improvement may be added to the foamed material version of the  
15 present invention by encapsulating the foamed material with a wax layer to add mechanical strength to the foamed material and also to give a supplementary benefit of more firmly locking in the scented material within the inner part of the pellet, ie within the foamed bulk material. This may be advantageous in situations where the pellet is highly scented  
20 as this scent tends to evaporate out of the pellet, so the encapsulating layer of solid wax being less porous prevents the scent evaporating.

A further advantage of adding a surrounding coat to the bulk material of the pellet is that should colour be desired for the pellet then the coating  
25 material may have a colourant such as a dye or pigment added to give the pellet a colour, and in this situation no colour needs to be added to the bulk material of the pellet. Now since the volume of the encapsulating layer may be less than that of the uncoloured inner pellet then the total coloured material added to the pellet is less which leads to less colour  
30 being added to the melt pool of the candle to which the pellet is added.



**EMBODIMENT A**

5 A preferred embodiment (**EMBODIMENT A**) of the invention will now be described with reference to Figure 2 that shows a simple scented wax pellet in section where the shape of the section is circular to represent a section through a spherical pellet though the shape of the pellet is not limited to being spherical and this shape is chosen by way of example.

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The pellet 11 of the present invention comprises a combustible bulk material which produces human safe gaseous combustion products when burned at normal candle burning temperatures, for instance a synthetic wax such as paraffin or a natural wax such as beeswax, and this bulk  
15 material makes up the greater part of the mass of the pellet, and into this bulk material has been introduced, and stably mixed, one or more scented additives such as a perfume or fragrant oil of any of the many available scents commercially available and often used in scented candle manufacture. Whilst the invention is not limited thereto, beneficial  
20 substances may be mixed within the bulk material for instance to assist in fixing the scented material within the bulk material of the pellet or to increase the pellet's hardness or ease of handling. Whilst the invention is not limited thereto, a colourant may be added to give the bulk material a colour, for instance to colour code the pellet according to its scent. This  
25 colourant may be a dye, pigment, or ink for instance.

Though not limited thereto, the structure of the bulk material of the pellet 11 is preferred to be a homogeneous solid, for instance a crystalline solid, or a foamed solid material, the latter for the purpose of more rapid  
30 melting once introduced to the melt pool of the candle, into which scented and other additives are uniformly mixed.

The shape of the pellet 11 may be of any suitable type for manufacture and ergonomic handling by the end user, and for ease of melting in the melt pool (figure 1, 3) of a typical candle. Suitable shapes include  
5 spherical, cylindrical, cigar shaped, tear-drop, oblate spheroid, cuboid, cut-off cylinder, disc, and the like. The pellet shape may of any generic "lump" like shape here as it is the volume of the pellet and its ingredients that are of importance to function since the pellet is designed to be melted in the melt pool of a candle after which point the original shape of the  
10 pellet is of no significance.

The pellet 11 may be of any suitable size for ergonomic handling by human fingers while being small enough in volume so that when introduced to a candle's melt pool then the volume of the melt pool is not  
15 increased to the point where the candle flame is swamped and extinguished, and in the present invention an object is to make the volume of the pellet small compared to the volume of a typical candle's melt pool. However, as an object of this invention is to add an adequate quantity of scented material to a typical candle's melt pool (3, figure 1) to  
20 effect a sufficient scent production from the candle while it burns, then the volume of the pellet should be so chosen to include a sufficient quantity of scented material for scenting the candle's melt pool on introduction of one or more scented pellets to this melt pool.

25 Accordingly a range of volumes and dimensions for the pellet are provided for in this embodiment, for example from 3mm or less maximum dimension for smaller candles through to 20mm or larger for bigger candles. Note that volume and size are not necessarily related since the structure of the pellet could be so chosen that the outside dimension of the  
30 pellet is larger than that of a spherical pellet of the same given volume.

The bulk material of the pellet is of a material suitable to hold the scented material and optional colour additives within it at normal room temperatures, is of a material that produces human safe combustion products when burned by a candle once introduced to the candle's melt pool, and this bulk material is selected to have suitable mechanical properties so that the material remains solid at room temperatures while holding these additives until the point at which the pellet is introduced into the candle melt pool which is necessarily at a temperature greater than the melting point of the pellet 11. Accordingly, the bulk material is of a type that has a melting temperature similar to waxes commonly found in commercial manufactured candles, for instance in the range 55 Centigrade to 90 Centigrade, so that when the pellet is placed in the candle melt pool then the bulk material melts.

Though not limited thereto, the bulk material is preferably a wax such as paraffin wax or an organic wax such as beeswax, and in particular though not limited thereto this wax may be a wax suited to holding high concentrations of scented oils or perfumes i.e. concentrations of 3% or more and typically 10% fragrance oil or perfume concentration, such as an organic votive wax.

The scented additive in the present invention may be of any type suitable for mixing with the bulk material of the pellet in the desired concentrations, though clearly additives with a higher concentration of active ingredients will permit a higher maximum scent concentration in the pellet, and the preferred scented additives for the present invention are highly concentrated, for instance perfumes or fragrant oils. The concentration of scented material added to the bulk material is chosen in the present invention to be up to and including the maximum percentage that the chosen bulk material can stably hold while remaining in solid form at room temperatures.

Though not limited thereto, the scented pellet 11 may also contain additives for the purpose of increasing scent uptake and retention, for instance the Vybar product brand which assists to stabilise scents within  
5 wax.

Though not limited thereto, the outside surface 12 of the pellet may be treated to increase retention of scent within the pellet for instance by impregnation of the surface by a scent stabiliser, for instance the brand  
10 additive Vybar or the like.

Though not limited thereto, the outside surface 12 of the pellet may be heat-treated to reduce porosity and thereby reduce the loss of scent through the surface.  
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Though not limited thereto, the outer surface 12 of the pellet may be chemically treated for the purpose of reducing its porosity.

Though not limited thereto, the outer surface 12 of the pellet may be  
20 chemically treated to give it a colour.

## EMBODIMENT B

25 A second embodiment of this invention (embodiment B) will now be described with reference to figure 3 which shows a cross-section through a pellet, here a spherical pellet showing a circular cross section though the shape of the pellet is not limited to this spherical shape.

30 In this embodiment of the invention a pellet 21 such as is described in Embodiment A is encapsulated within a material 23 with human safe

combustion products when burned in a typical wax candle, for instance a wax such as paraffin wax or an organic wax, for the purposes of either or both increasing the mechanical strength of the material 21 which it encapsulates or locking the scent of the pellet within the central material 5 21 through the introduction of a less permeable encapsulation layer 23.

Though the thickness of the encapsulating layer may be varied, it is preferred to be small compared to the dimensions of inner pellet 21, and the layer should be reasonably uniform in thickness though uniformity is 10 not a requisite to its function.

Though not limited thereto, the coating material 23 may contain a colourant such as a dye or pigment to give the pellet the coloured appearance for instance to colour code the pellet to its scent, for instance 15 an orange colour for a pellet containing an orange scented additive. By colouring only the outer layer 23 of the pellet then the colour content of the pellet is lower than if the bulk material 21 of the pellet had been coloured which has the effect of reducing the total volume of colourant added to the melt pool of the candle to which the pellet is added once the 20 pellet's material has mixed with this melt pool.

For the purpose of increasing strength and prevention of scent loss from the central scented material 21, the outer layer 23 need not be scented and an object of the current embodiment is to make this outside layer 25 relatively impervious to migration of the scented material through it, and therefore to lock this scent into the inside bulk material of the pellet 21.

Though not limited thereto, the outer layer 23 may contain beneficial additives for the purpose of increasing its mechanical strength.

Though not limited thereto, the outer layer 23 may contain beneficial additives for the purpose of reducing its porosity.

5 Though not limited thereto, the outer layer 23 may contain beneficial additives for the purpose of stabilising colourants contained within it such as dyes or pigments.

10 Though not limited thereto, the outer surface 24 of the pellet may be heat-treated for the purpose of reducing its porosity.

Though not limited thereto, the outer surface 24 of the pellet may be chemically treated for the purpose of reducing its porosity.

## 15 EMBODIMENT C

A third embodiment of this invention (embodiment C) will now be described with reference to figure 4 which shows a cross-section through a typical pellet here shown as a cigar shaped pellet in section by way of  
20 an example shape though the shape is not limited to this.

In this embodiment of the invention a pellet such as is described in Embodiment B has a bulk material 31 that is overly saturated with scented additives so that the bulk material 31 is a paste. The bulk material of the  
25 paste 31 is preferably a wax such as paraffin wax or an organic wax such as beeswax. The paste 31 is encapsulated within a hard combustible material 33 with human-safe combustion products at normal candle burning temperatures, for instance a wax such as paraffin wax or an organic wax such as beeswax, and this encapsulating layer has the  
30 purposes of giving the pellet mechanical strength and of locking the scent of the paste 31 within the pellet through the introduction of a solid

encapsulation layer 33 which is relatively impervious to the migration of the scented material through it.

Though not limited thereto, the material 33 may contain a colourant such as a dye or pigment to give the pellet a coloured appearance for instance to colour code the pellet to its scent, for instance an orange colour for a paste containing an orange scented additive. By colouring only the outer surface of the pellet then the colour content of the pellet is lower than if the paste 31 of the pellet had been coloured which has the effect of reducing the total quantity of coloured material added to the melt pool of the candle to which the pellet is added once the pellet's material has mixed within this melt pool.

For the purpose of increasing strength and prevention of scent loss from the central paste 31, the outer material 33 need not be scented and an object of the current embodiment is to make this outside coat relatively impervious as possible to migration of the scented material contained within the paste, and therefore to lock this scent into the inside of the pellet.

Though not limited thereto, the outer material 33 may contain beneficial additives for the purpose of increasing its mechanical strength.

Though not limited thereto, the outer material 33 may contain beneficial additives for the purpose of reducing its porosity.

Though not limited thereto, the outer material 33 may contain beneficial additives for the purpose of stabilising coloured additives contained within it such as dyes or pigments.

Though not limited thereto, the outer surface 34 of the pellet may be heat-treated for the purpose of reducing its porosity.

Though not limited thereto, the outer surface 34 of the pellet may be  
5 chemically treated for the purpose of reducing its porosity.

#### **EMDOBIMENT D**

10 Another embodiment of this invention (embodiment D) is shown in plan view in figure 5. The pellet 51 is a pellet such as is described in embodiment A or B of this description, however the pellet is so sized and shaped to permit the wick 54 of the candle to which the pellet is added to pass inside the pellet's outer bounding perimeter 52 while at the same  
15 time being smaller in diameter relative to the edge 56 of the melt pool 55 into which it is placed but is sized so as to provide a contact at one or more points between the edge 56 of the melt pool of the candle and the pellet 51 so that the range of movement of the pellet within the melt pool is restricted so as to prevent the inner edge 53 of the pellet from coming  
20 in close contact with the wick 54. The solid wax 57 of the candle is shown for a cylindrical style candle and this solid part lies outside of the melt pool 55, where the figure shows a plan view of the candle taken at the level of the top of the melt pool looking down the axis of the candle centred on the wick 54.

25

In this embodiment the pellet is either a complete annulus or is a partial annulus as shown in the figure, and in particular it may be shaped like a horseshoe, and preferably the shape may be a complete or partial circular annulus though oblate shapes are also acceptable. The outer diameter of  
30 the pellet is sized so as to be smaller than the diameter of the melt pool into which it is to be added, and as a range of candle sizes are to be



accommodated in this invention, then accordingly a range of pellet outer diameters is to be provided for.

By preventing the pellet from coming in close contact with the flame this  
5 has the desired effect of reducing the rate of melting of the pellet.

The total volume of the pellet must be kept small relative to the volume of the melt pool in order not to swamp the candle flame when the pellet is added, so since the diameter of the pellet is comparable to the diameter of  
10 the melt pool then the thickness of the pellet must be relatively small in order that the total pellet volume be kept small enough so as not to increase the volume of the melt pool to the point where the candle flame is swamped. Accordingly the preferred relative dimensions of the pellet describe a thin annulus or partial annulus. Such a pellet may be safely  
15 stored and transported on a spindle to avoid damage.

Also, as the pellet is relatively cool and in is solid when it is added to the melt pool then the pellet is likely to have a higher density than the melt and will likely come to rest on the bottom of the melt pool, and since the  
20 bottom of the melt is relatively cooler with respect to the surface layers of the melt pool then the bottom location of the pellet assists in reducing the rate of melting of the pellet leading to a more gradual release of the scented additives within the pellet and less likelihood of the candle wick being swamped.

25

#### **EMBODIMENT E**

In a final embodiment of the invention, the pellet comprises liquid scent encased in a solid bulk material such as wax. The bulk material must be  
30 sufficiently thick to as to prevent any leakage of the liquid scent prior to melting the pellet. The liquid scent may be introduced into the pellet in a

number of ways. For example, liquid scent may be injected into a hollow wax pellet and the injection hole sealed. The pellet may then be introduced into the melt pool of a candle according to the method described above.

5

As with other embodiments of the invention, the bulk material or outer surface of the pellet may be chemically or heat treated to reduce the porosity of the pellet or to increase the strength of the pellet. The strength of the pellet is particularly important in this embodiment since  
10 any damage caused to the pellet may result in leakage of the liquid scent.